

**IN THE UNITED STATES DISTRICT COURT
FOR THE DISTRICT OF DELAWARE**

GENERAL ELECTRIC COMPANY,

Plaintiff,

v.

LPP COMBUSTION, LLC,

Defendant.

C.A. No. 22-720-GBW

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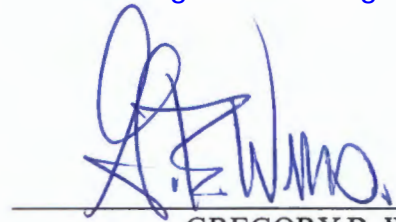
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MEMORANDUM OPINION

September 6, 2023
Wilmington, Delaware



GREGORY B. WILLIAMS
UNITED STATES DISTRICT JUDGE

Plaintiff General Electric Company (“GE” or “Plaintiff”) brought the present case seeking declaratory judgment of non-infringement and invalidity of U.S. Patent Nos. 7,770,396 (the ’396 patent), 7,934,924 (the ’924 patent), and 7,435,080 (the ’080 patent) (collectively, the “patents-in-suit” or “asserted patents”). Defendant LPP Combustion, LLC (“LPP” or “Defendant”) had previously filed an action of patent infringement in the Western District of Texas, alleging that GE and GE-related defendants infringe the asserted patents. *LPP Combustion LLC v. General Electric Company, GE Digital, and GE Gas Power*, C.A. No. 6:21-1343, D.I. 1 (W.D. Tex. Dec. 22, 2021). The patents-in-suit seek to provide methods and apparatuses that enable one to “operate lean, premixed combustion devices with alternate, higher hydrocarbon liquid fuels such as oil and diesel fuel and higher hydrocarbon fuel gases” while avoiding auto-ignition. ’396 patent at 1:47-1:50. “Auto-ignition is the spontaneous ignition of the fuel prior to the desired flame location in the combustion device.” *Id.* at 1:67-2:1. To avoid auto-ignition, the ’396 patent provides “mechanism[s] for producing pre-vaporized fuel gas with a reduced oxygen content relative to ambient air from a wide variety of liquid fuels or liquefied gases, which can be fed into a combustion device as a gaseous fuel.” *Id.* at 2:53-61.

The ’924 patent and the ’080 patent share a specification. D.I. 51 at 3, 9. These patents describe an invention that provides “continuous measurement and control of a combustion device by altering the fuel composition delivered thereto” by employing additives that either “enhance” or “retard” combustion. *See* ’080 patent, Abstract.

Before the Court is the issue of claim construction of multiple terms in the asserted patents. The Court has considered the parties' Joint Claim Construction Brief ("JCCB"), the accompanying appendix, and Amended Claim Construction Chart. D.I. 51; D.I. 52; D.I. 57. The Court also reviewed LPP's Motion to Strike and related briefing. D.I. 54; D.I. 55; D.I. 58. The Court held both a *Markman* hearing and oral argument, D.I. 63, on July 6, 2023 (the "Hearing").

I. LEGAL STANDARDS

"It is a bedrock principle of patent law that the claims of a patent define the invention to which the patentee is entitled the right to exclude." *Phillips v. AWH Corp.*, 415 F.3d 1303, 1312 (Fed. Cir. 2005) (en banc) (internal quotation marks omitted); *see also Corning Glass Works v. Sumitomo Elec. U.S.A., Inc.*, 868 F.2d 1251, 1257 (Fed. Cir. 1989) ("A claim in a patent provides the metes and bounds of the right which the patent confers on the patentee to exclude others from making, using, or selling the protected invention"). "[T]here is no magic formula or catechism for conducting claim construction." *Phillips*, 415 F.3d at 1324. The Court is free to attach the appropriate weight to appropriate sources "in light of the statutes and policies that inform patent law." *Id.* The ultimate question of the proper construction of a patent is a question of law, although subsidiary fact-finding is sometimes necessary. *Teva Pharm. USA, Inc. v. Sandoz, Inc.*, 574 U.S. 318, 326 (2015) (quoting *Markman v. Westview Instruments, Inc.*, 517 U.S. 370, 372 (1996)).

"The words of a claim are generally given their ordinary and customary meaning as understood by a person of ordinary skill in the art when read in the context of the specification and prosecution history." *Thorner v. Sony Comput. Ent. Am. LLC*, 669 F.3d 1362, 1365 (Fed. Cir. 2012) (citing *Phillips*, 415 F.3d at 1312-13). A person of ordinary skill in the art "is deemed to read the claim term not only in the context of the particular claim in which the disputed term

appears, but in the context of the entire patent, including the specification.” *Phillips*, 415 F.3d at 1313.

“When construing claim terms, [the courts] first look to, and primarily rely on, the intrinsic evidence, including the claims themselves, the specification, and the prosecution history of the patent, which is usually dispositive.” *Sunovion Pharms., Inc. v. Teva Pharms. USA, Inc.*, 731 F.3d 1271, 1276 (Fed. Cir. 2013). “Other claims of the patent in question, both asserted and unasserted, can . . . be valuable” in discerning the meaning of a disputed claim term because “claim terms are normally used consistently throughout the patent,” and so, “the usage of a term in one claim can often illuminate the meaning of the same term in other claims.” *Phillips*, 415 F.3d at 1314. In addition, “[d]ifferences among claims can also be a useful guide[.]” *Id.* For example, “the presence of a dependent claim that adds a particular limitation gives rise to a presumption that the limitation in question is not present in the independent claim.” *Id.* at 1314-15.

In addition to the claim, the Court should analyze the specification, which “is always highly relevant to the claim construction analysis ... [as] it is the single best guide to the meaning of a disputed term.” *Vitronics Corp. v. Conceptronic, Inc.*, 90 F.3d 1576, 1582 (Fed. Cir. 1996). It is also possible that “the specification may reveal a special definition given to a claim term by the patentee that differs from the meaning it would otherwise possess. In such cases, the inventor’s lexicography governs.” *Phillips*, 415 F.3d at 1316. “Even when the specification describes only a single embodiment, [however,] the claims of the patent will not be read restrictively unless the patentee has demonstrated a clear intention to limit the claim scope using words or expressions of manifest exclusion or restriction.” *Hill-Rom Servs., Inc. v. Stryker Corp.*, 755 F.3d 1367, 1372 (Fed. Cir. 2014) (internal quotation marks omitted) (quoting *Liebel-Flarsheim Co. v. Medrad, Inc.*, 358 F.3d 898, 906 (Fed. Cir. 2004)). And the specification “is not a substitute for, nor can it be

used to rewrite, the chosen claim language.” *SuperGuide Corp. v. DirecTV Enters., Inc.*, 358 F.3d 870, 875 (Fed. Cir. 2004).

The Court “should also consider the patent’s prosecution history, if it is in evidence.” *Markman*, 52 F.3d at 980. The prosecution history “can often inform the meaning of the claim language by demonstrating how the inventor understood the invention and whether the inventor limited the invention in the course of prosecution[.]” *Phillips*, 415 F.3d at 1317.

In some cases, the Court “will need to look beyond the patent’s intrinsic evidence and to consult extrinsic evidence in order to understand, for example, the background science or the meaning of a term in the relevant art during the relevant time period.” *Teva*, 574 U.S. at 331. Extrinsic evidence “consists of all evidence external to the patent and prosecution history, including expert and inventor testimony, dictionaries, and learned treatises.” *Markman*, 52 F.3d at 980. Overall, while extrinsic evidence may be useful, it is “less significant than the intrinsic record in determining the legally operative meaning of claim language.” *Phillips*, 415 F.3d at 1317 (internal quotation marks and citations omitted).

II. AGREED UPON TERMS

On July 5, 2023, the parties filed a joint stipulation letter agreeing to the constructions of “combustion enhancer” and “gaseous fuel feed/fuel feed.” D.I. 60. The parties agreed to adopt the plain and ordinary meaning of the terms. *Id.* In the Amended Claim Construction Chart, LPP clarified the plain and ordinary to mean that a combustion enhancer includes compounds that, when added to a fuel mixture, enhance combustion such as by increasing flame temperature, flame speed, or volumetric heat release rate. D.I. 57-1. For gaseous fuel feed/fuel feed, LPP clarified that the plain and ordinary meaning refers to the feed that carries fuel both before and after the additive is inserted. Put another way, it does not cease to be a “fuel feed” after it is adjusted via

the introduction of an additive. D.I. 57-1. The Court adopts the agreed-upon constructions of plain and ordinary meaning for these terms.

III. DISPUTED TERMS

Claim Term	Defendant LPP's Construction	Plaintiff GE's Construction	Court's Construction
diluent gas ('396 patent, claims 1 and 10)	gas with a reduced oxygen concentration relative to ambient air	a non-fuel gas that is added to the fuel flow	gas with a reduced oxygen concentration relative to ambient air
inert ('396 patent, claims 1 and 10)	"inert" is context-specific. In the context of these claims, an inert diluent gas has (1) a reduced oxygen concentration relative to ambient air and (2) is in a state where a chemical reaction that could lead to autoignition upstream of the combustion zone is slow or prevented	reduced oxygen concentration relative to air, and not containing hydrocarbons	reduced oxygen concentration relative to air, and not containing chemically reactive species such as hydrocarbons
configured ('396 patent, claims 1 and 10)	Plain and ordinary meaning, i.e., a combustion device is "configured" pursuant to this limitation if, based on its design and operation, the device would experience autoignition in advance of the combustion zone if the claimed gas mixture were fed into the device without being mixed with the claimed diluent gas. For example, if the liquid fuel were vaporized into air, rather than a diluent	actually programmed or equipped with hardware	based on its design and operation, spontaneous ignition of the fuel prior to the desired flame location in the combustion device would occur if the vaporized fuel gas were to be premixed with the second gas containing oxygen without any diluent gas being present

Claim Term	Defendant LPP's Construction	Plaintiff GE's Construction	Court's Construction
	gas, a device "configured" pursuant to this limitation would experience autoignition in advance of the combustion zone.		
fuel gas ('396 patent, claims 1, 10, 11 and 18)	Plain and ordinary meaning, i.e., a fuel gas must be a gas. The claim language does not also capture fuel that is only partially in a gaseous state	partially or completely vaporized liquid fuel	Plain and ordinary meaning, i.e., a fuel gas must be a gas
reaction of the fuel gas upstream of the combustion zone is suppressed ('396 patent, claims 1 and 10)	chemical reaction that could lead to autoignition upstream of the combustion zone is slowed or prevented	indefinite	chemical reaction that could lead to auto-ignition upstream of the combustion zone is slowed or prevented such that no auto-ignition would occur prior to combustion zone
wherein the additive includes a combustion enhancer or a combustion retardant depending on whether the sensed fuel characteristic is above or below the acceptable range ('080 patent, claims 1, 19, 20 and 22); wherein additive includes a combustion enhancer or a combustion retardant depending on whether the senses combustion	Plain and ordinary meaning, i.e., the limitation is satisfied by a system capable of adding a combustion enhancer depending on the sensed characteristic. Similarly, the limitation is satisfied by a system capable of adding a combustion retardant depending on the sensed characteristic. Finally, the limitation is satisfied by a system capable of adding a	wherein the additive is capable of including at least one combustion enhancer and at least one combustion retardant, the particular additive to be supplied depending on whether the sensed fuel characteristic is above or below the acceptable range	Plain and ordinary meaning, i.e., the limitation is satisfied by a system capable of adding a combustion enhancer depending on the sensed characteristic. Similarly, the limitation is satisfied by a system capable of adding a combustion retardant depending on the sensed characteristic. Finally, the limitation is satisfied by a system capable of adding a

Claim Term	Defendant LPP's Construction	Plaintiff GE's Construction	Court's Construction
characteristic is above or below the acceptable range ('924 patent, claims 1 and 16)	combustion enhancer in some circumstances and a combustion retardant in other circumstances		combustion enhancer in some circumstances and a combustion retardant in other circumstances
acceptable range ('080 patent, claims 1, 19, 20 and 22; '924 patent, claims 1 and 16)	Plain and ordinary i.e., the range of values for a given sensed characteristic that will not require introduction of an additive. Put another way, if a sensed characteristic falls within the system's acceptable range, no additive is required. But, if a sensed characteristic falls outside the system's acceptable range, an additive is required to bring then combustion to within specifications	indefinite	Plain and ordinary meaning, i.e., the range of values for a given sensed characteristic that will not require introduction of an additive. Put another way, if a sensed characteristic falls within the system's acceptable range, no additive is required. But, if a sensed characteristic falls outside the system's acceptable range, an additive is required to bring then combustion to within specifications

1. "diluent gas" ('396 patent)

Defendant LPP's Construction	Plaintiff GE's Construction	Court's Construction
gas with a reduced oxygen concentration relative to ambient air	a non-fuel gas that is added to the fuel flow	gas with a reduced oxygen concentration relative to ambient air

LPP argues that the "diluent gas" should be construed to mean "gas with a reduced oxygen concentration relative to ambient air." D.I. 57-1. GE asserts that the term should be construed to mean "non-fuel gas that is added to the fuel flow." *Id.* In other words, GE seeks to exclude fuel from qualifying as a "diluent gas." Hearing Tr. at 20:2-5, 38:21-33.

“It is axiomatic that we will not narrow a claim term beyond its plain and ordinary meaning unless there is support for the limitation in the words of the claim, the specification, or the prosecution history.” *3M Innovative Props. Co. v. Tredegar Corp.*, 725 F.3d 1315, 1333 (Fed. Cir. 2013) (citations omitted). “If the intrinsic record supports several definitions of a term, the term may be construed to encompass all such consistent meanings.” *Wasica Fin. GmbH v. Cont’l Auto. Sys., Inc.*, 853 F.3d 1272, 1281 (Fed. Cir. 2017) (citation omitted). “Therefore, absent a clear disavowal or alternative lexicography by a patentee, he or she ‘is free to choose a broad term and expect to obtain the full scope of its plain and ordinary meaning.’” *Id.* at 1282 (quoting *Thorner*, 669 F.3d at 1367).

The Court begins its analysis with the language of the claim itself. Use of the disputed term in claim 1 of the ’396 patent is representative:

1. A method for operating a combustion device, the method comprising the steps of:

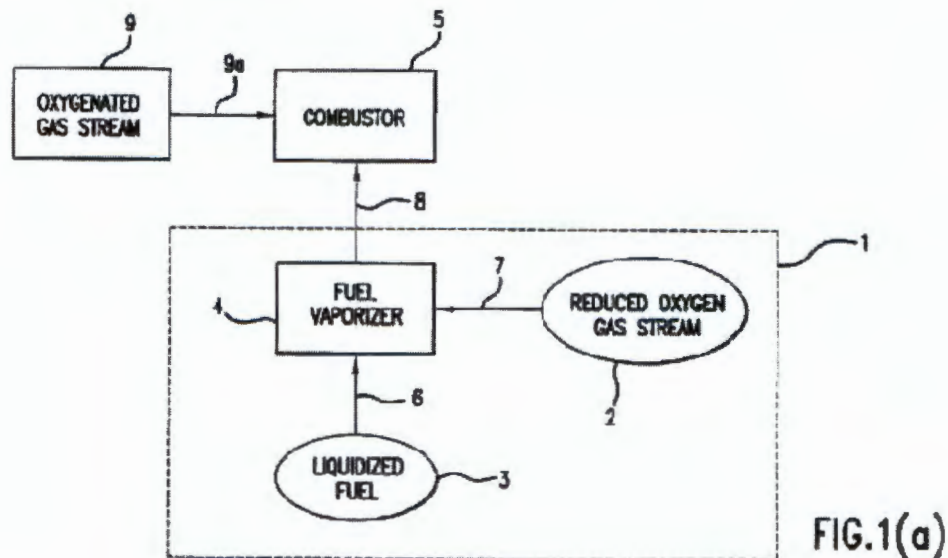
producing a fuel gas using a liquid fuel comprising hydrocarbon molecules and a diluent gas;

premixing the fuel gas with a second gas containing oxygen to produce a gas mixture in a premixing zone located upstream of a combustion zone of a combustion device, the combustion device being configured such that autoignition of the gas mixture would occur upstream of the combustion zone in the absence of the diluent gas; and

combusting the gas mixture in the combustion zone of the combustion device;

wherein the diluent gas is inert and present in an amount such that reaction of the fuel gas upstream of the combustion zone is suppressed.

D.I. 1-1, Ex. C (the '396 patent) at claim 1.¹ As LPP argues, diluent gas is a “reduced oxygen gas stream that dilutes a fuel to avoid autoignition.” D.I. 51 at 16-17. In support, LPP cites the patent specification. In Fig. 1(a) of the '396 patent, LPP identifies the “reduced oxygen gas stream” as the claimed diluent gas. D.I. 51 at at 17; '396 patent at 6:8-11 (“The reduced oxygen gas stream source 2 produces a gas stream with an oxygen content that is reduced relative to ambient air, which is commonly taken as containing approximately 21% O₂.”). GE does not appear to disagree. D.I. 51 at 21 (“While LPP is correct that a ‘diluent gas’ could be a ‘reduced oxygen stream,’ it does not follow that diluent gas could be a *fuel* lacking oxygen.” (emphasis in original)).



LPP explains that, in the preferred embodiment shown in Fig. 1(a), the fuel gas is produced in a vaporizer unit 4, where the liquid fuel is combined with the reduced oxygen gas stream, producing fuel gas stream 8. See '396 patent at 5:44-50, 6:47-48 (“the reduced oxygen vaporized fuel gas stream 8 is fed...”)). This understanding aligns with the Applicant’s remarks

¹ The term “diluent gas” only appears in the claim language, and not the patent specification. See D.I. 51 at 20.

in the prosecution history: “The vaporized fuel stream (the ‘fuel gas’ of claim 1) ‘has been conditioned to avoid auto-ignition by mixing with the oxygen reduced stream’ (the ‘diluent gas’ of claim 1).” D.I. 37-2 at 80; D.I. 51 at 18.

GE argues that the construction of “diluent gas” should reflect a “non-fuel gas.” GE cites to the claim language which requires production of a “fuel gas” using a “liquid fuel comprising hydrocarbon molecules and a diluent gas.” ’396 patent, claim 1. GE reasons that this language expressly distinguishes “diluent gas” from “fuel gas” and thus the construction must reflect as much. D.I. 51 at 18-19. Furthermore, GE asserts that the negative limitation is based in the technology because “changing the oxygen content of a fuel does not make the fuel any less reactive—the fuel will be just as reactive once oxygen is added.” D.I. 51 at 19 (citing D.I. 52 (“Lemieux Decl.”) ¶¶ 36, 45).

However, LPP points out that the patent specification leaves room for the diluent gas to contain hydrocarbons. *See* ’396 patent at 6:27-31 (“In some of these embodiments, the gas supplied by reduced oxygen gas stream source 2 is inert; in yet other embodiments, the gas from source 2 contains hydrocarbons (e.g., methane and/or higher hydrocarbons); 7:61-8:3 (“By way of example, the heating value of a fuel gas is approximately proportional to the number of carbon atoms in the gas molecule. Therefore, pentane (C_5H_{12}) has approximately 5 times the heating value of the primary component of natural gas, methane (CH_4). If liquified pentane were used as the liquid fuel in the system of FIG. 3, the vaporizer 4 would be configured to output a fuel gas stream comprising one part vaporized pentane gas and four parts reduced oxygen gas for use with an engine 14 having a fuel gas distribution system configured for metering methane on a volumetric basis.”).

GE relies on Dr. Lemieux and submits his findings via declaration to show why fuel gas would not be practical. Lemieux Decl. ¶ 50 (“LPP’s construction would potentially include gases that can react directly with the hydrocarbon containing vaporized liquid” and “there would be ‘reactions’ far upstream of the combustion zone[.]”). *See generally id.* at ¶¶ 41-50.

GE seeks to import limitations into the construction and is inconsistent with its reasoning. First, GE purports that the embodiment identified in the patent wherein the reduced oxygen content gas containing hydrocarbons is not a fuel. *Compare* D.I. 51 at 20 (“[containing hydrocarbons] does not transform the reduced oxygen gas into a fuel, nor does it lead to the conclusion that a POSA would read the patent to disclose a reduced oxygen fuel as a diluent.”), *with id.* at 23 (“Nor does the patent’s identification of reduced oxygen gases that may “contain hydrocarbons”—which are not inert and, therefore not claimed—equate to gases **comprising** hydrocarbons, i.e., a **fuel**.” (emphasis in original)). GE seeks to have this Court parse out, without any support from the specification, that a diluent gas containing hydrocarbons may be acceptable, but a diluent gas containing too many hydrocarbons qualifies as a fuel and thus cannot be the diluent gas claimed.

This Court agrees with LPP that GE’s construction imports a negative limitation not clearly provided for by the intrinsic evidence. The ’396 patent provides for various ways to qualify as a reduced oxygen gas stream, and one such embodiment includes a gas containing hydrocarbons:

[i]n some embodiments of the invention, the reduced oxygen gas stream has an oxygen content below the limiting oxygen index. The limiting oxygen index (LOI) is the concentration of oxygen in the local environment below which a material will not support combustion and varies for different types of liquid fuels. The LOI is typically between about 10% and about 14% and is approximately 13% for many higher hydrocarbon fuels. The more the oxygen content of the gas stream from the source 2 is reduced, the more auto-ignition is suppressed. However, more work (i.e., energy) is required to produce a gas stream with a lower oxygen content. This work will reduce the overall efficiency of the system. Thus, in some embodiments, the oxygen content from the stream source 2 is just low enough to suppress auto-ignition by the required amount, which may be above or below the LOI. In other embodiments of the invention, the reduced oxygen gas stream source 2 contains no

oxygen. In some of these embodiments, the gas supplied by reduced oxygen gas stream source **2** is inert; in yet other embodiments, the gas from source **2** contains hydrocarbons (e.g., methane and/or higher hydrocarbons).

'396 patent at 6:8-31.

The parties agree that the reduced oxygen gas stream is the diluent gas in the claims, *see* D.I. 51 at 21 (“The parties agree that the claimed ‘diluent gas’ is the extensively discussed ‘reduced oxygen gas stream.’”); Lemieux Decl. ¶ 31 (“[T]he claims refer to this oxygen-reduced air stream as ‘diluent gas.’”). Thus, the construction of the term should reflect the various embodiments the specification provides for the reduced oxygen gas stream (*i.e.*, “diluent gas”) including gases with an oxygen content below the LOI, inert gases, and gases that contain hydrocarbons. *See* '396 patent at 6:8-31; *Tierra Intelectual Borinquen, Inc. v. HTC Corp.*, 2014 WL 1912341, at *9 (E.D. Tex. May 13, 2014) (“[T]he specification does not use [the claim] term” and “[t]he Court therefore considers the specification as a whole for context.”). Therefore, this Court adopts LPP’s construction that “diluent gas” is “a gas with a reduced oxygen concentration relative to ambient air.”

2. “inert” ('396 patent)

Defendant LPP’s Construction	Plaintiff GE’s Construction	Court’s Construction
“inert” is context-specific. In the context of these claims, an inert diluent gas has (1) a reduced oxygen concentration relative to ambient air and (2) is in a state where a chemical reaction that could lead to autoignition upstream of the combustion zone is slowed or prevented	reduced oxygen concentration relative to air, and not containing hydrocarbons	reduced oxygen concentration relative to air, and not containing chemically reactive species such as hydrocarbons

The parties dispute whether a person of ordinary skill in the art (POSA) would understand that a hydrocarbon-containing gas, even in the absence of oxygen, would be a fuel. LPP asserts that “a gas may be inert in some scenarios, but not in others” and thus, is context specific. D.I. 51 at 24. In support, LPP cites to related European patent prosecution, D.I. 37-3 at 98-99, wherein the Applicant made the same arguments that LPP makes now—that “inert” is not the same as “an oxygen content less than ambient air” and that “inert” is context-specific. “Any construction of ‘inert’ must account for the fact that the claims are not limited to diluent gases that are inert in all contexts.” D.I. 51 at 24-25 (citing Applicant’s argument in D.I. 37-3 at 98 that “[i]t should be understood that ‘inert’ is context sensitive . . . ambient air is inert with respect to some substances (e.g., diamond) but not others (e.g., hydrocarbon fuels).”). LPP also argues that “inert” is a modifier of a “diluent gas” and focuses on the reactivity—“when a fuel is vaporized into a diluent gas, that diluent gas is considered ‘inert’ if the chemical reactions that might lead to autoignition are slowed or prevented.” *Id.* at 25. Notably, this argument raised before the European patent office was ultimately rejected. *See* D.I. 37-3 at GE_DEL_00001120 (3/17/2014 EP Office Action”) (“The expressions for inert gas as submitted by the applicant ‘Inert in this context’ or ‘truly inert gas’ cannot be considered as a substantial definition for inert gas.”).

GE revitalizes its arguments for “diluent gas” here with the argument that a fuel comprised of hydrocarbons would lead to auto-ignition, and thus the construction of the term “inert” should exclude hydrocarbons. GE cites to the intrinsic evidence to support its conclusion that “inert” gas is meant to be separate from other gas streams discussed in the specification, and that LPP claims only the embodiments that use inert gas. *Intamin Ltd. v. Magnetar Techs., Corp.*, 483 F.3d 1328, 1337 (Fed. Cir. 2007) (“[T]his court has acknowledged that a claim need not cover all embodiments.”). The ’396 patent specification states:

Thus, in some embodiments, the oxygen content from the stream source 2 is just low enough to suppress auto-ignition by the required amount, which may be above or below the LOI. In other embodiments of the invention, the reduced oxygen gas stream source 2 contains no oxygen. *In some of these embodiments, the gas supplied by reduced oxygen gas stream source 2 is inert; in yet other embodiments, the gas from source 2 contains hydrocarbons* (e.g., methane and/or higher hydrocarbons)

'396 patent at 6:23-31 (emphasis added). *See also id.* at 3:6-8 (“[i]n an embodiment of the present invention, *an inert gas stream or other gas stream* with a reduced oxygen concentration relative to air” (emphasis added)). GE’s construction is supported by the patent specification’s language distinguishing inert gas streams from other diluent gas streams.

The specification also describes using vitiated exhaust gas from a pre-burner to provide a reduced oxygen stream. *Id.* at 3:21-24. GE submits that “in some instances, there could be hydrocarbons left over from an incomplete combustion process” and that “in such instances the reduced oxygen gas would not be considered ‘inert.’” Lemieux Decl. ¶ 53. To support this assertion, GE cites to the file history of the '396 patent, pointing out that the examiner listed examples of inert gases, none of which were hydrocarbon fuels. *See* D.I. 37-3, App. O at GE_DEL_00001126-27 (4/12/2013 EP Office Action) (“typical inert gases are nitrogen, carbon dioxide, or exhaust gases with low oxygen content.”). LPP also argued during prosecution that:

inert in this context refers to a stream that does not react, or only very slowly reacts, with a fuel. By utilizing a stream with reduced oxygen levels and *stripped of other reactive species* [], the applicant’s system does not require a closely-coupled vaporizer /combustor system since the auto-ignition process will not start until the vaporized fuel is combined with the combustion air.

D.I. 37-3, App. P at GE_DEL_00001199 (10/22/2013 Response to EP Office Action) (emphasis added). Both parties agree that an inert gas should not contain chemically reactive species. Hearing Tr. at 74:18-22, 77:14-18. The question remains as to whether “hydrocarbons” would qualify. GE asserts that hydrocarbon fuels are always reactive, citing Dr. Lemieux, and thus would

need to be stripped to qualify the gas stream as inert. Lemieux Decl. ¶ 57; Hearing Tr. at 77:14-80:2.

Reading the claim language in context with the specification and prosecution history, it appears that the invention claimed does not encompass all embodiments in the specification. Specially, the specification describes embodiments wherein the diluent gas is “inert” and “in yet other embodiments, the gas from source 2 contains hydrocarbons.” ’396 patent at 6:26-31. Thus, the specification makes a clear distinction between a diluent gas being inert and containing hydrocarbons. Paired with the Dr. Lemieux’s declaration, the Court is convinced that “inert” gas in the context of this invention does not include gas containing hydrocarbons.

For the reasons stated above, “inert,” as used in the ’396 patent, means “reduced oxygen concentration relative to air, and without chemically reactive species such as hydrocarbons.”

3. “configured”

Defendant LPP’s Construction	Plaintiff GE’s Construction	Court’s Construction
Plain and ordinary meaning, i.e., combustion device is “configured” pursuant to this limitation if, based on its design and operation, the device would experience autoignition in advance of the combustion zone if the claimed gas mixture were fed into the device without being mixed with the claimed diluent gas. For example, if the liquid fuel were vaporized into air, rather than a diluent gas, a device “configured” pursuant to this limitation would experience autoignition in advance of the combustion zone	actually programmed or equipped with hardware	based on its design and operation, spontaneous ignition of the fuel prior to the desired flame location in the combustion device would occur if the vaporized fuel gas were to be premixed with the second gas containing oxygen without any diluent gas being present

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Prior to the *Markman* hearing, the parties already “appear[ed] to agree that the purpose of the [’396 patent] is to take a combustion device that would otherwise experience auto-ignition upstream of the combustion zone and operate it in a manner where auto-ignition does not occur.” D.I. 51 at 39. The parties also agreed that “configuring a system requires programming” and “requires more than mere capability.” *Id.* at 40-41. But GE asserted that LPP’s construction introduces subjective intent, and that a person would not design a combustion unit specifically to cause auto-ignition. *Id.* (citing *Cochlear Bone Anchored Sols. AB v. Oticon Med. AB*, 958 F.3d 1348, 1356 (Fed. Cir. 2020)).

However, during the *Markman* hearing, the parties agreed to a definition proposed by this Court after hearing argument. *See* Hearing Tr. at 86:25-87:10. Accordingly, the Court adopts the parties’ agreed-upon construction and construes the term “configured” to mean “based on its design and operation, spontaneous ignition of the fuel prior to the desired flame location [in] the combustion device would occur if the vaporized fuel gas were to be premixed with the second gas containing oxygen without any diluent gas being present.” *Id.* *See also id.* at 86:5-24.

4. “fuel gas” (’396 patent)

Defendant LPP’s Construction	Plaintiff GE’s Construction	Court’s Construction
Plain and ordinary meaning, i.e., a fuel gas must be a gas. The claim language does not also capture fuel that is only partially in a gaseous state	partially or completely vaporized liquid fuel	Plain and ordinary meaning, i.e., a fuel gas must be a gas

The parties dispute whether fuel gas can be partially vaporized or must be fully vaporized. LPP asserts that the fuel gas must a gas and cites to claim 1 of the '396 patent: “producing a fuel gas using liquid fuel comprising hydrocarbon molecules and a diluent gas.” '396 patent at claim 1. LPP then goes on to say that because fuel gas is comprised of a liquid fuel and a diluent gas, it is improper to limit fuel gas to just the liquid fuel portion. D.I. 51 at 42. “In other words, the vaporized liquid fuel is *used to produce* the fuel gas, but it is not alone the fuel gas.” *Id.* (emphasis in original). LPP also cites to the specification for support: “a gas stream with a reduced oxygen concentration relative to air is used to vaporize liquid fuel or liquified higher hydrocarbon natural gas, and the reduced oxygen vaporized fuel gas is fed to a combustion device.” '396 patent at 3:7-10.

At the outset, GE states that it does not dispute that the claimed “fuel gas” is comprised of both the vaporized liquid fuel comprising hydrocarbons as well as the diluent gas. “Instead, GE’s construction seeks to clarify that the liquid fuel component of the fuel gas can be completely or only partially vaporized[.]” D.I. 51 at 43. GE cites to the intrinsic record for support: “In other embodiments, the liquid fuel stream is partially or completely vaporized, e.g., by heating the liquid fuel, prior to mixing it with the reduced oxygen gas stream 7.” '396 patent at 5:52-58.

This Court is not persuaded by GE’s arguments that the construction of the claim term specifies the status of the vaporization at the time of formulation of the fuel gas. The '396 patent does not suggest that the resulting fuel gas can contain liquid fuel, as GE insists. '396 patent at 5:52-58. Instead, the language is only clarifying when the mixing can occur—that is, that the fuel vaporization process may begin, or even be complete, before the diluent gas is introduced. D.I. 51 at 44. *See also* '396 patent at 5:52-53 (“The order in which the mixing and vaporizing occurs is

not important.”) Thus, GE’s construction that the fuel gas can be/contain the liquid state is unsupported by the intrinsic evidence.

Accordingly, this Court adopts LPP’s proposed construction of “plain and ordinary meaning” for the term fuel gas, i.e., a fuel gas must be a gas.

5. “reaction of the fuel gas upstream of the combustion zone is suppressed” (’396 patent)

Defendant LPP’s Construction	Plaintiff GE’s Construction	Court’s Construction
chemical reaction that could lead to autoignition upstream of the combustion zone is slowed or prevented	indefinite	chemical reaction that could lead to auto-ignition upstream of the combustion zone is slowed or prevented such that no auto-ignition would occur prior to combustion zone

The parties dispute whether the term is indefinite. Specifically, the parties dispute whether LPP’s construction, in conjunction with its proposed construction for inert, conflates the requirements in the claim language.

Claim 1 of the ’396 patent reads in relevant part:

Wherein the diluent gas is inert and present in an amount such that reaction of the fuel gas upstream of the combustion zone is suppressed.

’396 patent at claim 1.

LPP brings back its proposed constructions for Terms 1 (diluent gas) and 2 (inert) to explain that “some diluent gases are ‘inert’ such that chemical reactions that might lead to autoignition are slowed or prevented.” D.I. 51 at 45. LPP cites to the Applicant’s October 22, 2013 Response to show that the examiner and applicant agreed on the term: “The examiner states that an ‘inert gas stream’ is ‘a stream of gas which does not or only very slowly react[s] with a fuel.’ The applicant agrees with this construction, subject to an understanding of what ‘very slowly

react[s]’ means to a person of ordinary skill in the field of combustion.” D.I. 37-3 (App. P) at GE_DEL_00001197. Thus, it follows that the reaction in the term is the chemical reaction that causes autoignition.

GE asserts that the term, especially in conjunction with LPP’s construction of inert, is indefinite. More specifically, GE argues that the claim language requires diluent gas to be (1) inert, and (2) “present in an amount such that reaction of the fuel gas upstream of the combustion zone is suppressed.” D.I. 51 at 46. According to GE, LPP “collapse[s] these separate requirements into one.” *Id.* GE asserts that LPP’s definition of inert “must always slow or prevent the chemical reaction that could lead to autoignition upstream of the combustion zone.” *Id.* (citation and quotations omitted).

According to GE, if this Court were to accept LPP’s construction, a person could practice the claims and auto-ignition would still occur because LPP’s definition says the reaction would be slowed or prevented. To say it is slowed is to say it could still occur upstream, just later, and thus the lack of parameters leads the term to be indefinite.

GE then argues that “reaction” is undefined and LPP writes into the claims that the reaction is one that would lead to autoignition. D.I. 51 at 47.

Finally, GE states that “these ambiguities lead a reader unable to discern whether a contemplated combustion system or method would or would not infringe the claims.” D.I. 51 at 47 (citing *Nautilus, Inc. v. Biosig Instruments, Inc.*, 572 U.S. 898, 909 (2014) (“a patent must be precise enough to afford clear notice of what is claimed, thereby apprising the public of what is still open to them.”)).

GE must show by clear and convincing evidence that the claim is indefinite. *Consumeron, LLC v. Maplebear Inc.*, C.A. No. 21-1147-GBW, 2023 WL 246883, at *3 (D. Del. Jan. 18, 2023)

(“The challenger must ‘prov[e] indefiniteness by clear and convincing evidence.’”) (quoting *BASF Corp. v. Johnson Matthey Inc.*, 875 F.3d 1360, 1365 (Fed. Cir. 2017)). This Court finds that GE has not met its burden. The claim language makes clear that the diluent gas must be (1) inert, but also (2) present in an amount such that the reaction is suppressed. ’396 patent at claim 1. GE claims that “inert” covers both requirements, but both parties’ definitions of inert fail to provide an amount component—even if inert gas is meant to suppress the reaction upstream and prevent autoignition, the claim language still explains that there must be enough to accomplish that—and that both the type of diluent gas and the amount of gas lead to the ultimate end: the suppression of a reaction of the fuel gas upstream. Additionally, this Court has already adopted the definition of inert to exclude reactive hydrocarbons and thus GE’s argument here appears to be moot. Therefore, the claim term is not superfluous of inert.

Next, GE takes issue with its reading of LPP’s construction to mean that autoignition could still occur because the reaction is “slowed” or prevented. D.I 51 at 47. During the hearing, the Court proposed the following qualifier to address GE’s concern with “slowed,” that is, the reaction is “slowed” where no auto-ignition occurs prior to combustion zone. Hearing Tr. 103:11-15, 107:24-108:8. The qualifier is supported by the intrinsic evidence. *See, e.g.*, ’396 patent at 3:10-14 (“By mixing the fuel with a gas stream that has an appropriately reduced concentration of oxygen, reaction of the vaporized fuel can be prevented or sufficiently delayed so as to avoid auto-ignition.”). More importantly, the claim language requires preventing premature combustion by using a diluent gas. ’396 patent at claim 1 (“the combustion device being configured such that autoignition of the gas mixture would occur upstream of the combustion zone in the absence of the diluent gas.”). “[A] person of ordinary skill in the art is deemed to read the claim term not

only in the context of the particular claim in which the disputed term appears, but in the context of the entire patent, including the specification.” *Phillips*, 415 F.3d at 1313.

For the reasons above, this Court finds that the term is not indefinite and construes the term “reaction of the fuel upstream of the combustion zone is suppressed” to mean “chemical reaction that could lead to autoignition upstream of the combustion zone is slowed or prevented such that no auto-ignition would occur prior to combustion zone.”

6. **“wherein the additive includes a combustion enhancer or a combustion retardant depending on whether the sensed fuel characteristic is above or below the acceptable range (’080 patent, claims 1, 19, 20 and 22); wherein additive includes a combustion enhancer or a combustion retardant depending on whether the senses combustion characteristic is above or below the acceptable range (’924 patent, claims 1 and 16)**

Defendant LPP’s Construction	Plaintiff GE’s Construction	Court’s Construction
Plain and ordinary meaning, i.e., the limitation is satisfied by a system capable of adding a combustion enhancer depending on the sensed characteristic. Similarly, the limitation is satisfied by a system capable of adding a combustion retardant depending on the sensed characteristic. Finally, the limitation is satisfied by a system capable of adding a combustion enhancer in some circumstances and a combustion retardant in other circumstances	wherein the additive is capable of including at least one combustion enhancer and at least one combustion retardant, the particular additive to be supplied depending on whether the sensed fuel characteristic is above or below the acceptable range	Plain and ordinary meaning, i.e., the limitation is satisfied by a system capable of adding a combustion enhancer depending on the sensed characteristic. Similarly, the limitation is satisfied by a system capable of adding a combustion retardant depending on the sensed characteristic. Finally, the limitation is satisfied by a system capable of adding a combustion enhancer in some circumstances and a combustion retardant in other circumstances

The parties dispute whether these systems must have the ability to provide both recited additives (enhancer and retardant), or if only providing one of the two meets the claims.

In support of its construction, LPP cites to various case law to support its contention that using the disjunctive “or” “plainly designates that a series describes alternatives.” *SkinMedia, Inc. v. Histogen, Inc.*, 727 F.3d 1187, 1199 (Fed. Cir. 2013). *See also Wasica*, 853 F.3d at 1280 (“Using the disjunctive ‘or’ as in ‘numbers or symbols’ designates numbers and symbols as distinct alternatives to one another.”); D.I. 51 at 50-51 (citing cases).

GE argues that this is a question of capability: “do the claims require a system that is capable of *only* feeding an enhancer or *only* feeding a retardant, or do the claims require a system that is capable of feeding *both* an enhancer *and* a retardant, albeit at separate times?” *Id.* at 51 (emphasis in original). GE urges this Court to read the patent as a whole, as the specification makes clear that the invention requires the system to be able to provide either an enhancer or a retardant. *See* ’080 patent at 8:52-56 (“If there is a problem (e.g., fuel composition outside of predetermined acceptable range for combustion device operation device operation) in step **225**, the proper change to the fuel combustion (e.g., addition of appropriate additive to fuel feed) is determined.”); *see also id.* at 1:61-2:9; 2:28-46; 2:10-27; 2:47-62 (discussing embodiments and situations where, when the performance characteristics of the fuel are outside an acceptable range, an additive is fed to the fuel to adjust accordingly).

GE also cites to *Ameranth, Inc. v. Menusoft Sys. Corp.*, C.A. No. 2:07-271-CE, 2010 WL 1610079, at *6-7 (E.D. Tex. April 21, 2010) for its holding that the system must have the capabilities of providing both additives. In *Ameranth*, the court analyzed a different case, *Cyrix Corp. v. Intel Corp.* and found that “[t]he court [in *Cyrix*] held that the claimed address generating means must ‘hav[e] the capability of’ receiving both the segmentation and page cache options.” *Id.* at *6 (citing *Cyrix Corp. v. Intel Corp.*, 846 F. Supp. 522, 530 (E.D. Tex. 1994), *aff’d*, 42 F.3d 1411 (Fed. Cir. 1994)). “But it was not necessary for the segmentation and page cache entries to

be actually stored in the memory at the same time. Based upon *Cyril*, the defendants contend that the software must be capable of transmitting a second menu to both wireless handheld devices and Web pages” despite the claim language reading “transmitting said second menu to a wireless handheld computing device or Web page.” *Id.* at *6-7 (emphasis added).

GE also cites to the prosecution history. During prosecution, the original claim 6 “require[d] an enhancer in some circumstances [(when the sensed characteristic was below “predetermined range”)] and a retardant in others [(when the sensed characteristic was above the range)].” D.I. 51 at 54 (citing D.I. 37-3, Ex. H). This, GE asserts, is LPP clearly stating that the invention must have both capabilities. However, the examiner notes that the amended limitations were “somewhat broader than those in claim 6 as the limitations to claim 1 allow the use of either a combustion enhancer or a retardant if the sensed fuel characteristic is either too high or too low.” D.I. 37-3, Ex. J at LPP_GE_000050. This suggests that claim 1, the one we have here, was broader than claim 6, which did require the invention provide an enhancer at times and a retardant at other times. Ultimately supports LPP’s argument that the present claims can be met by providing either an enhancer or a retardant.

This Court is not convinced by GE’s argument that this Court should not adopt the plain and ordinary meaning and has not shown that “or” should be read to mean both the additive and retardant are required by the system—the claim language itself does not appear to require that it must have the capability to have both, and the Court “must take care not to import limitations into the claims from the specification.” *Phillips*, 415 F.3d at 1323; *Abbott Laby’s v. Sandoz, Inc.*, 566 F.3d 1282, 1288 (Fed. Cir. 2009). Thus, the Court will construe the terms to have their plain and ordinary meaning, that is “the limitation is satisfied by a system capable of adding a combustion enhancer depending on the sensed characteristic. Similarly, the limitation is satisfied by a system

capable of adding a combustion retardant depending on the sensed characteristic. Finally, the limitation is satisfied by a system capable of adding a combustion enhancer in some circumstances and a combustion retardant in other circumstances.”

7. **“acceptable range”** (’080 patent, claims 1, 19, 20 and 22; ’924 patent, claims 1 and 16)

Defendant LPP’s Construction	Plaintiff GE’s Construction	Court’s Construction
Plain and ordinary meaning, i.e., the range of values for a given sensed characteristic that will not require introduction of an additive. Put another way, if a sensed characteristic falls within the system’s acceptable range, no additive is required. But, if a sensed characteristic falls outside the system’s acceptable range, an additive is required to bring then combustion to within specifications	indefinite	Plain and ordinary meaning, i.e., the range of values for a given sensed characteristic that will not require introduction of an additive. Put another way, if a sensed characteristic falls within the system’s acceptable range, no additive is required. But, if a sensed characteristic falls outside the system’s acceptable range, an additive is required to bring then combustion to within specifications

a. LPP’s Motion to Strike GE’s Sur-Reply Argument (D.I. 54)

LPP requests this Court to strike GE’s “reliance on argument raised for the first time in [GE’s] Sur-Reply Claim Construction Brief (D.I. 51 at 61-6.2)” as it pertains to GE’s argument on the term “acceptable range.” For the reasons this Court gave during oral argument, the motion to strike, DI. 54, is DENIED. Hearing Tr. at 8:6-9:9.

b. Claim Construction Arguments

The parties dispute whether “acceptable range” is a term of degree such that there are no boundaries provided and a POSA is not given the appropriate parameters. LPP asserts that “[t]he

claims recite a process through which a combustion characteristic (e.g., flame color) or fuel characteristic (e.g., fuel performance) is sensed and an additive is introduced to the fuel if the sensed characteristic falls outside an ‘acceptable range.’ As is clear from the claim language, whether a range is ‘acceptable’ depends not only on the specific sensed characteristic, but also on the combustion device itself.” D.I. 51 at 58-59.

“Words of degree are not ‘inherently indefinite,’ but ‘the court must determine whether the patent provides some standard for measuring that degree.’” *Ironburg Inventions Ltd. v. Valve Corp.*, 64 F.4th 1274, 1284 (Fed. Cir. 2023) (quoting *Biosig*, 783 F.3d at 1378). GE argues that the term “acceptable range” “fail[s] to inform, with reasonable certainty, those skilled in the art about the scope of the invention.” D.I. 51 at 60 (quoting *Nautilus*, 572 U.S. at 901). GE specifically asserts that the lack of objective boundaries means the term must be indefinite. *Id.* at 61 (citing *Sci. Applications Int’l Corp. v. United States*, 154 Fed. Cl. 594, 639 (2021) (finding “substantially offset” indefinite because “no objective way exists to calculate how much offset is acceptable”); *Advanced Aerospace Techs., Inc. v. United States*, 124 Fed. Cl. 282, 304 (2015) (“designed to deflect” indefinite because the patent “does not provide any guidance of acceptable ranges to establish parameters, nor teach how such ranges could be determined”); *Valinge Innovation AB v. Halstead New England Corp.*, 2018 WL 2108199, at *4 (D. Del. May 7, 2018) (“not susceptible to damage caused by moisture” was indefinite because “the intrinsic record [did] not provide any objective indication of what level of susceptibility to moisture damage, if any, is acceptable or unacceptable”)).

First, LPP points to instances in the specification where standards for measuring combustion factors are provided. D.I. 51 at 59 (citing ’080 patent at 7:37-40 (premixed combustion systems “operate in a narrow stability region between flashback and blow-off”); *id.* at 7:44-46

(“[f]lame speed must generally equal flow velocity for stable combustion”); *id.* at 7:61-64 (“[t]he loss of flame stability leads to pressure fluctuations and pulsations, and resonant acoustics, which can cause damage to and degradation of hot section components”); *id.* at 4:19-24 (“The controller can also maintain constant combustion properties by such methods as maintaining a constant index of combustion. The index, as described below, can be a Wobbe Index, or a Weaver Index, or both (or some other index devised to characterize combustion properties of a fuel.”)).

Next, LPP challenges GE’s arguments, stating that the cases GE cites “stand for the unremarkable proposition that claimed ranges may be indefinite if a POSA would not understand how to determine that claimed ranges may be indefinite if a POSA would not understand how to determine the claimed range due to the patent’s lack of guidance.” D.I. 51 at 61. LPP then goes on to say: “[t]ellingly, GE introduces no evidence on this point, even from its own expert” and “its brief relies entirely on attorney argument, vaguely suggesting that the described ranges are subjective.” *Id.* GE heard LPP’s criticisms and cited to their expert’s declaration. In his declaration, Dr. Lemieux expresses that “neither the claims themselves nor the specifications of the ’080 and ’924 Patents provide sufficient guidance to inform as POSA what ranges are “acceptable” as that term is used in the challenged claims.” Lemieux Decl. ¶ 59.

But, as cited above, there are some concrete examples in the patent specification that provide combustion factors and how to monitor. ’080 patent at 7:44-46; 4:19-24. Additionally, LPP provides citations to the intrinsic evidence that do not provide concrete examples of a combustion characteristic and corresponding acceptable range, but instead provide that conditions must be such that a negative reactions like flashback and blow-off, ’080 patent at 7:37-40, pressure fluctuations and pulsations, *id.* at 7:61-64, and resonant acoustics, which can cause damage to and degradation of hot section components, *id.*, be avoided.

Terms of degree or approximation are not inherently indefinite. *See Interval Licensing*, 766 F.3d at 1370. LPP has cited to multiple portions of the patent specification that provide multiple combustion characteristics that could be monitored and therefore modified to maintain a controlled system. '080 patent at 7:44-46 (“[f]lame speed must generally equal flow velocity for stable combustion.”); *id.* at 4:19-24 (“The controller can also maintain constant combustion properties by such methods as maintaining a constant index of combustion. The index, as described below, can be a Wobbe Index, or a Weaver Index, or both (or some other index devised to characterize combustion properties of a fuel.”). “All that is required is some standard for measuring the term of degree.” *Exmark Mfg. Co. Inc. v. Briggs & Stratton Power Prods. Grp., LLC*, 879 F.3d 1332, 1346 (Fed. Cir. 2018). Based on the evidence presented thus far, GE has failed to prove by clear and convincing evidence that the term is indefinite. *See Grace Instrument Indus., LLC v. Chandler Instruments Co., LLC*, 57 F.4th 1001, 1008 (Fed. Cir. 2023). The specification provides with “reasonable certainty an objective boundary for ‘acceptable range.’” *Cirba Inc. v. VMware, Inc.*, C.A. No. 19-742-LPS, 2019 WL 6327707, at *9 (D. Del. Nov. 26, 2019) (finding the term “acceptable range” not indefinite where the specification provided examples and objective boundaries). Thus, the Court will construe “acceptable range” to have its plain and ordinary meaning, that is “the range of values for a given sensed characteristic that will not require introduction of an additive. Put another way, if a sensed characteristic falls within the system’s acceptable range, no additive is required. But, if a sensed characteristic falls outside the system’s acceptable range, an additive is required to bring then combustion to within specifications.”

IV. CONCLUSION

For the reasons explained above, the Court adopts the constructions described herein. The Court will issue an Order consistent with this Memorandum Opinion.